

# Is technology assisted guided self-help successful in treating female adolescents with bulimia nervosa?

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## Summary

**Objective** This study aims to evaluate the long-term outcome of new technology assisted guided self-help in adolescents with bulimia nervosa (BN).

**Methods** One hundred and twenty-six patients with BN (29 adolescents and 97 adults) were randomly allocated to a cognitive behavioural therapy-based self-help program delivered by the Internet or bibliotherapy, both accompanied by e-mail guidance. Outcomes were assessed at baseline, month 4, 7 and 18 including remission rates and eating disorder associated psychopathology.

**Results** In all, 44% of adolescents vs. 38.7% of adults were in remission at month 7, and 55% of adolescents vs. 62.5% of adults were in remission at follow-up. Objective binge eating and compensatory behaviour improved significantly over time in both groups, with the highest decrease during the first 4 months. A significant decrease over time and no group differences have been found in almost all EDI-2 subscales.

**Conclusions** E-mail guided self-help (delivered via the Internet or bibliotherapy) is equally effective for adolescents as for adults with BN, and can be recommended as an initial step of treatment for this younger age group.

**Keywords:** Bulimia nervosa, Treatment, Adolescents, Guided-self-help, New technologies

**Ist der Einsatz von technologie-basierten geleiteten Selbsthilfeprogrammen in der Therapie von Jugendlichen mit Bulimia nervosa hilfreich?**

## Zusammenfassung

**Ziel** Evaluierung von Langzeiteffekten Technologie-basierter geleiteter Selbsthilfeprogramme in der Therapie von Jugendlichen mit Bulimia nervosa (BN).

**Methodik** 126 Patientinnen mit BN (29 Jugendliche und 97 Erwachsene) wurden in kognitiv-behaviorale Selbsthilfeprogramme mit E-Mail Unterstützung randomisiert, die entweder über das Internet oder als Bibliotherapie angeboten wurden. Evaluierungen erfolgten zu Beginn der Interventionen, nach 4, 7 und 18 Monaten, und Remissionsraten und essstörungsspezifische Psychopathologie wurde erfasst.

**Ergebnisse** Insgesamt waren 44% der Jugendlichen und 38.7% der Erwachsenen nach Ende der Intervention (Monat 7) in Remission sowie 55% der Jugendlichen und 62.5% der Erwachsenen waren zum Follow-up Zeitpunkt nach 18 Monaten in Remission. Die Anzahl der Essanfälle und kompensatorischen Maßnahmen verbesserte sich signifikant über die Zeit in beiden Gruppen, mit der deutlichsten Reduktion während der ersten 4 Monate. Signifikante Besserung über die Zeit, aber keine Gruppeneffekte zeigte sich in fast allen EDI-2 Skalen.

**Schlussfolgerungen** E-Mail gestützt Selbsthilfeprogramme (im Internet oder als Bibliotherapie) sind für Jugendliche ebenso wirksam wie für Erwachsene mit BN und können als erster Behandlungsschritt für diese jüngere Altersgruppe empfohlen werden.

**Schlüsselwörter** Bulimia nervosa, Therapie, Jugendliche, Geleitete Selbsthilfeprogramme, Neue Technologien

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## Introduction

Bulimia nervosa (BN) develops in adolescence and without treatment, tends to persist into adulthood [1]. Although different treatment methods for BN have been evaluated in randomised control trials for adults [2], only a few have been conducted with adolescents suffering from BN. Family-based treatment (FBT) has been compared with either cognitive behavioural therapy (CBT) based self-care or supportive psychotherapy [1, 3]. FBT was found to be superior to supportive psychotherapy considering clinical outcome after treatment and at follow-up. A larger reduction in BN symptomatology has been achieved with CBT-guided self-care at the end of treatment compared to FBT, but at 1 year follow-up, this predominance disappeared. However, CBT-guided self-care was found to be more cost-effective compared to FBT, and widely accepted by adolescents [4, 5].

Guided self-help is recommended as first intervention in a stepped care approach in the treatment of BN by the NICE guidelines for adults, and has been proven to also be effective in adolescence [4, 6]. CBT-based guided self-help care is usually provided as bibliotherapy, and has been proven to be equally effective as CBT face-to-face therapy and offers a good long-term outcome [7, 8]:

It is now also available in different formats using new technology like CD-Rom or the Internet. Trials using Internet-based guided self-help have given promising results for adults [9–12], and its effectiveness and feasibility has been shown for adolescents also [4]. For adolescents, bibliotherapy combined with 10 face-to-face therapy sessions have been compared to FBT and found to be more cost-effective and lead to a faster symptom reduction after treatment compared to FBT. This difference disappeared at 12 months follow-up. In an uncontrolled study for adolescents (13–20 years), web-based CBT self-help interventions with electronic message boards and e-mail support have found significant eating disorder symptom reduction after 3 months, which could be maintained at 6 months [4].

It has been suggested that only a minority of patients with BN receive CBT for two different reasons. On one hand there is a shortage of CBT trained psychotherapists, while on the other hand BN is a psychiatric disorder with an extraordinary shameful connotation preventing adolescents with BN from initiating treatment. Therefore, adolescents with BN may prefer self-help treatments. Many of them are computer literate and communicate well, using the new technology. An internet-delivered CBT-based treatment may overcome these barriers and enable BN patients to access evidence-based treatments [13].

In line with the NICE guidelines, internet-based guided self-help may have the potential as a first step in the intervention for adolescents with BN. For some, this kind of treatment is sufficient, for others it may also serve as a stepping stone to continue with further treatment. E-mail support in particular, has provided a greater sense of care for participants. Accessibility, flexibility, sense of control over treatment and anonymity has been found to be an advantage with this type of treatment [4, 5].

Only a few studies have explored the use of new technology as CD-ROM or Internet-based programmes in the treatment of BN in adults [9–12, 14], and only one in adolescents, and promising results have been found [4].

However, longer term follow-up studies that can provide information on the further development of bulimic symptomatology, and continuation of face-to-face psychotherapy after web-based guided self-help intervention for adolescents are still missing. According to the NICE guidelines, efficacy studies of the treatment of adolescents with BN are needed [6].

## Aims

Therefore, our aim was to evaluate the long-term effectiveness of new technology assisted CBT-based guided self-help in female adolescents with BN, compared to female adults with BN. We hypothesised that the intervention is equally effective for both adolescents and adults, and that bulimic symptomatology improves by the end of treatment and at follow-up.

## Methods

### Participants

The study was carried out at the Eating Disorders Unit, Department of Child and Adolescent Psychiatry at the Medical University of Vienna, Austria in collaboration with the Eating Disorders Department at the Parkland-klinik, Germany. We obtained approval by the Ethics Committee of the Medical University of Vienna. Inclusion criteria were: female sex, an age of 16–35 years, fulfilment of the diagnostic criteria for BN purging type and EDNOS with bulimic symptoms according to DSM-IV-R, and a body mass index (BMI) above 18. Exclusion criteria were acute suicidality, severe depression or other mental disorders affecting cognition, current drug abuse and current participation in cognitive-behavioural therapy. Detailed information on recruitment and sample description is given in Wagner et al. [15].

### Intervention

Participants were either enrolled on an Internet-based guided self-help intervention (SALUT BN) with weekly e-mail support (INT-GSH), or guided bibliotherapy with weekly e-mail support (BIB-GSH) for a period of 4–7 months. INT-GSH is a self-help programme for BN provided by an Internet platform, as bibliotherapy the self-help manual *Getting better bit(e) by bit(e)* was used [16]. Both interventions are based on CBT and start with motivational elements. Psycho-educative elements are provided in both formats so as to explain the mechanisms of the vicious circle of dieting, binge eating and compensatory behaviours in connection with feelings of guilt and

negative self-evaluations. In both interventions, leading a food diary is a central element in order to monitor food intake and trigger analyses of binge eating and compensatory behaviour. In a subsequent step, patients should try to consume regular meals and avoid binge eating and compensatory behaviours. Techniques how this can be realised are taught. Modules on problem solving, cognitive restructuring, self-assertiveness training and relapse prevention are provided. The aim of the e-mail guidance is to motivate patients and guide them through the programme and also intervene when there are problems with the self-help guide or other problems coming up. Although patients can write as many e-mails as they like, the therapist writes back once a week.

In the SALUT BN, patients get feedback on triggers for binge eating, evolution of binge eating behaviour and compensatory measures and regular food intake in form of charts and graphs. Coaches have an insight on the patients' food diaries and on how they progress with the program. While in SALUT BN the progression to the next module is only possible when the previous module is completed, the chapters in the book can be worked on more flexibly.

Patients were assessed at four time points: at baseline (T0), at four months (T1), at seven months (T2) and at 18 months (T3).

## Measures

### Questionnaire anamnesetique pour les troubles alimentaire (QATA)

The QATA was developed by the University Hospital of Geneva to obtain socio-demographic information, information about binge eating behaviour and compensatory measures over the previous 3 months to ascertain DSM-IV eating disorder diagnosis. It also contains information on previous anorexia nervosa (AN), previous psychotherapy or clinical treatment [14].

### Eating disorder inventory (EDI-2)

The EDI-2 is a widely used, standardised, self-report measure of psychological symptoms commonly associated with anorexia nervosa, bulimia nervosa and other eating disorders. It is aimed at the measurement of psychological traits or symptom clusters presumed to have relevance to understanding and treatment of eating disorders. The EDI-2 consists of 11 subscales derived from 91 items presented in a six-point, optional choice format requiring respondents to answer whether each item applies "always", "usually", "often", "sometimes", "rarely" or "never". Internal consistency reliability coefficients for the EDI-2 scales are between 0.44 and 0.93. The original subscales show appropriate content, convergent and discriminant validity [17]. In the German version, excellent validity and reliability data are also available [18].

At follow-up (T2) we obtained information whether or not patients had been engaged in face-to-face therapy after the intervention.

## Statistical analysis

The SPSS19 programme was used. Comparisons on demographic characteristics and remission/abstinence rates at the end, and at follow-up between adolescent and adult female patients were conducted with t test for quantitative measures, and chi square tests for categorical outcome. To assess the effectiveness of the interventions in both age groups, linear mixed-model analyses were performed. As long as no differences had been found between both intervention programmes (INT-GSH and BIB-GSH), data was analysed jointly (Wagner et al. [15]). This involved a 2 (group: adolescents and adults)  $\times$  4 (time: baseline, month 4, 7 and 18) mixed design for each of the quantitative variables (binge eating and compensatory behaviours assessed by the QATA interview, and ED-specific psychopathology measured through EDI-2 scores). List wise deletion method was applied. When necessary, Bonferroni-adjusted post hoc analyses were conducted to value the effect of age group or time conditions. When the main effects of time were statistically significant, orthogonal polynomial contrasts were estimated to value the linear, quadratic and cubic trends over phases, using as metric the distance in months between assessments (0, 4, 7, 18). All hypotheses were tested at a significance level of 0.05.

## Results

A total of 126 female patients with BN started with either INT-GSH ( $n=70$ ) or BIB-GSH ( $n=56$ ). In the INT-GSH 25.7% ( $n=18$ ) were adolescents (between 16 and 21 years) and 74.3% ( $n=52$ ) adults (between 22 and 34 years) in BIB-GSH 19.6% ( $n=11$ ) adolescents and 80.4% ( $n=45$ ) adults, respectively. As there were no outcome differences between both treatments, both treatment groups were combined together leading to a total of  $n=29$  adolescents and  $n=97$  adults.

Regarding socio-demographic and eating disorder specific variables at baseline, differences between adolescents and adults have been found in terms of current age (as expected), age at onset of illness, and illness duration (Table 1). Concerning compensatory behaviour, monthly laxative abuse at baseline was higher in adults than in adolescents ( $p=0.0365$ ). About one-third of the patients had suffered from previous AN in both groups ( $p=0.710$ ). More than half had previous psychotherapy or inpatient treatment in the adolescent (53.6%) and adult group (72.3%). The majority of participants had participated with a minimum of 8 weeks (completers), 69% ( $n=20$ ) in the adolescent group and 59.8% ( $n=58$ ) in the adult group. Differences are not significant ( $\chi^2=.796$ ,  $p=0.372$ ). No differences between baseline

**Table 1.** Comparison between adolescent and adult patients with BN regarding baseline demographic and clinical characteristics

Demographic and clinical characteristics	Adolescents ( <i>n</i> =29)	Adults ( <i>n</i> =98)	Comparison	
Quantitative measures; Mean ( <i>SD</i> )	Means ( <i>SD</i> )	Means ( <i>SD</i> )	t-value	<i>p</i>
Age	19.31 (1.77)	26.10 (3.34)	−14.397	<0.001
Age at onset of the eating disorder	15.96 (2.13)	17.73 (3.48)	−2.539	0.012
Eating disorder duration (years)	3.93 (2.59)	9.84 (4.62)	−8.809	<0.001
Body mass index (kg/m <sup>2</sup> )	20.17 (2.04)	20.77 (2.61)	−1.129	0.261
Objective binge eating episodes in the previous month	38.71 (48.65)	31.15 (31.76)	0.969	0.334
Vomiting episodes in the previous month	60.79 (86.68)	38.20 (53.69)	1.307	0.200
Episodes of laxative abuse in the previous month	0.39 (0.99)	1.82 (6.29)	−2.125	0.036
Episodes of excessive sports in the previous month	5.68 (9.60)	5.66 (11.29)	0.007	0.995
Episodes of fastening in the previous month	7.79 (15.50)	6.00 (13.46)	0.596	0.553
Dichotomous measures; % ( <i>M</i> )			$\chi^2$	<i>p</i>
Anorexia nervosa history before bulimia nervosa	33.3 (9/27)	37.2 (35/94)	0.138	0.710
Previous formal psychotherapeutic and in-patient treatments	53.6 (15/28)	72.6 (69/95)	3.628	0.057

*BN* bulimia nervosa, *SD* standard deviation

socio-demographic and clinical characteristics could be found between completers and non-completers.

Concerning the evolution of monthly binge eating and compensatory behaviour (Table 2), there are no differences between adolescents and adults, except there is a trend for higher monthly binge eating frequency in adolescents compared to the adult group ( $p=0.051$ ). A significant improvement over time could be found for monthly binge eating, vomiting and fasting for both groups, showing a linear and quadratic trend. This indicates that the decrease in binge eating and compensatory behaviour (vomiting and fasting) is higher within the first 4 months of therapy and then plateaus. In addition, a cubic trend was also observed for fasting, since there is a slight increase in frequency of this compensatory behaviour between 4- and 7-months.

### Health status at month 7 and 18

As can be seen in Table 3, after treatment (month 7) almost half of the patients were abstinent from binge eating and compensatory behaviour, or did not fulfil BN DSM-IV criteria any more. Age groups did not differ regarding health status following treatment ( $\chi^2=0.191$ ,  $p=0.662$ ).

At follow-up (month 18) 55% ( $n=11$ ) adolescent patients, and 62.5% ( $n=35$ ) adult patients were abstinent from binge eating and compensatory behaviour or no longer fulfilled the BN DSM-IV criteria. Age groups did not differ regarding health status after treatment ( $\chi^2=0.347$ ,  $p=0.556$ ). Finally, more than 40% ( $n=9$ ) adolescents and 35.4% ( $n=23$ ) adults continued with formal psychotherapy after the technology assisted GSH. The age groups showed no difference regarding therapy continuation ( $\chi^2=0.216$ ,  $p=0.642$ ).

EDI-2 scores did not differ between adolescents and adults with BN except for maturity fears scale, with higher

mean scores in the adolescents group (Table 4). All subscale scores except perfectionism improved over time, showing a linear trend, with highest decrease within the first 4 months of therapy, and then evens out or slightly increases at the end of follow-up (quadratic trend). In addition, ascetism scores slightly increased between 4- and 7-month follow-ups.

### Discussion

The importance of early interventions in patients with BN has been demonstrated. In Wagner et al. [15] it has been shown that both guided self-help formats—either provided via an Internet platform (SALUT BN), or via conventional bibliotherapy (Getting better bit(e) by bit(e))—combined with e-mail support are effective in treating BN not only in the short, but also in long-term. In this study we evaluated the long-term effectiveness of technology assisted guided self-help in female adolescents with BN, compared with adults with BN.

In our study, adolescents did not differ in binge/purging behaviour at the beginning of treatment, but in monthly laxative abuse, showing that younger patients used this compensatory measure less often than adults. In the adolescent as well as in the adult group, objective binge eating, vomiting and fasting could be equally improved over time, indicating that technology assisted GSH is equally effective for both age groups. Symptoms changed most within the first 4 months of treatment and proceeded further until the end of treatment and follow-up. Remission and abstinence rates after treatment and at 18 month follow-up did not differ between age groups. Eating disorder associated psychopathology could be equally improved over time in both age groups.

As long as studies with adolescents are scarce, our results seem promising. However, Schmidt et al. [1] found a slightly better outcome for adolescents (remission

**Table 2.** Change in binge eating and compensatory behaviours over time regarding adolescent and adult patients included in the analyses

Episodes during the previous month	Group (n)	Means (SD)							ANOVA: F (p value)				Polynomial trends (time): F (p value)*			
		T0	T1	T2	T3	T3	Interaction	Group	Time	Contrasts (time) <sup>a</sup>	LT	QT	CT			
Objective binge eating	Adult (44)	25.32 (25.62)	15.50 (27.59)	10.95 (17.15)	11.27 (25.54)	11.27 (25.54)	1.27 (0.198)	3.97 (0.051)	9.30 (0.003)	0 > 1, 2, 3	32.1 (<0.001)	5.61 (0.021)	0.50 (0.485)			
	Adolescent (16)	46.31 (57.29)	30.88 (40.14)	31.00 (58.96)	17.88 (29.20)	17.88 (29.20)				1 > 3						
Vomiting	Adult (45)	37.67 (65.79)	21.36 (38.30)	15.40 (30.09)	11.33 (25.53)	11.33 (25.53)	1.62 (0.208)	2.17 (0.146)	11.7 (0.001)	0 > 1	21.9 (<0.001)	7.16 (0.010)	3.48 (0.067)			
	Adolescent (16)	73.44 (104.2)	29.88 (41.26)	30.25 (59.17)	18.19 (29.61)	18.19 (29.61)				1 > 3						
Excessive sports	Adult (45)	7.20 (14.48)	4.16 (7.55)	3.67 (6.63)	0.93 (3.40)	0.93 (3.40)	1.43 (0.237)	0.02 (0.898)	2.03 (0.159)	-	-	-	-			
	Adolescent (16)	3.94 (8.00)	2.75 (5.00)	5.25 (13.99)	3.06 (5.90)	3.06 (5.90)										
Fasting	Adult (45)	5.73 (12.68)	1.56 (4.84)	0.29 (0.99)	0.22 (0.88)	0.22 (0.88)	1.32 (0.256)	3.23 (0.077)	8.25 (0.006)	0 > (1 = 2 = 3)	8.33 (0.005)	8.29 (0.006)	8.01 (0.006)			
	Adolescent (15)	11.13 (20.42)	1.00 (2.30)	5.00 (14.39)	1.93 (7.22)	1.93 (7.22)										
Laxative abuse	Adult (45)	1.07 (5.32)	0.80 (5.22)	0.36 (1.87)	0.67 (4.47)	0.67 (4.47)	0.89 (0.350)	0.19 (0.667)	0.44 (0.511)	-	-	-	-			
	Adolescent (16)	0.38 (1.02)	0.06 (0.25)	0.56 (2.25)	0.06 (0.25)	0.06 (0.25)										

T0 baseline, T1 4 months, T2 7 months, T3 18 months, LT linear trend, QT quadratic trend, CT cubic trend  
<sup>a</sup>Multiple comparisons with Bonferroni's correction  
<sup>\*</sup>Metric for polynomial contrasts taking into account the different interval between phases (0, 4, 7, 18)

**Table 3.** Remission rates at the end of treatment (month 7) and at follow-up (month 18) for adolescent and adult patients

Outcomes (%)	Adolescents	Adults	$\chi^2$	p
Remission or abstinent month 7 (yes)	44.4 % (8/18)	38.7 % (24/62)	0.191	0.662
Remission or abstinent month 18 (yes)	55.0 % (11/20)	62.5 % (35/56)	0.347	0.556
Psychotherapy after T2 (yes)	40.9 % (9/22)	35.4 % (23/65)	0.216	0.642

rates of 58.1 % at month 6 and 60 % at month 12) when compared to our results (44.4 and 55 % at 7-month and 18-month follow-ups). In their study, guided bibliotherapy in form of 10 face-to-face sessions had been offered. Some variations between both studies can explain the differences found: younger adolescents (about 2 years) with a shorter eating disorder duration (2.5 vs. 3.9 years) which implies that patients may be at an earlier stage of their illness, and a higher percentage of subclinical cases (31.8 vs. 10 %) at the beginning of the treatment. Hence, we might therefore also assume that the earlier patients with BN can receive treatment, the prospects are better for clinical improvement and abstinence of symptoms.

The effectiveness of another Internet-based e-mail guided self-help programme in an adolescent clinical population [4] with a comparable age and duration of illness to our sample found lower remission rates at month 6 of those who completed the programme (35 vs. 44.4 %), despite our sample showing higher frequency of eating disorder symptomatology. One explanation could be that while the number of completed modules seemed comparable in both studies, e-mail contact was low for Pretorius et al. [4] with a mean e-mail contact of two per patient. This issue highlights the importance of regular e-mail contact.

In addition, Sanchez-Ortiz et al. [11] found abstinence rates of 69.5 % after 6 months using a guided online treatment programme for 3-6 months. These results were found in a student population with lower eating disorder symptomatology and higher percentage of patients with EDNOS (47.4 %) than ours, but results suggest that an early screening and detection of the disorder followed by immediate treatment (such as online guided self-help programmes) seem to be essential for a favourable outcome.

The cost advantage of self-help formats in comparison to FBT has been pointed out previously. In Schmidt et al. [1], 28 % of eligible adolescents refused to commence treatment as they did not want to involve their family. To overcome a typical illness duration of 10 years in an adult population with BN and avoid the development of a chronic course, computerised CBT is a suitable way to provide early treatment.

It has also been stated that computerised CBT interventions are a good alternative to manual-based self-care as they are more interactive and individually tailored [12].

E-mail is used as a medium to provide therapeutic guidance and support in CBT self-care programmes [19, 20]. Advantages for the patients are that they can e-mail at any

**Table 4.** Change in eating disorder associated psychopathology measured by the EDI-2 over time regarding adolescent ( $n = 14$ ) and adult ( $n = 47$ ) patients included in the analyses

EDI-2 subscales	Group ( $n$ )	Means ( $SD$ )		ANOVA: $F$ ( $p$ value)					Polynomial trends (time): $F$ ( $p$ value)*			
		T0 (baseline)	T1 (4 months)	T2 (7 months)	T3 (18 months)	Interaction	Group	Time	Contrasts (time) <sup>a</sup>	LT	QT	CT
Drive for thinness	Adult (47)	11.68 (5.97)	7.32 (6.10)	5.21 (5.36)	6.26 (6.05)	0.51 (0.679)	0.00 (0.965)	16.8 (<.001)	0 > 1 (= 2 = 3)	15.2 (<0.001)	29.7 (<0.001)	0.47 (0.497)
	Adolescent (14)	10.86 (5.48)	6.50 (6.04)	5.86 (6.51)	7.00 (5.45)							
Bulimia	Adult (47)	9.00 (4.31)	4.98 (4.43)	2.83 (3.78)	3.06 (3.44)	0.98 (0.402)	0.82 (0.368)	25.7 (<0.001)	0 > 1 > 2 (= 3)	43.4 (<0.001)	30.4 (<0.001)	0.01 (0.943)
	Adolescent (14)	8.71 (6.13)	5.79 (5.41)	4.61 (5.58)	4.64 (5.39)							
Body dissatisfaction	Adult (47)	12.70 (7.96)	9.00 (7.95)	6.74 (6.28)	8.32 (7.89)	1.94 (0.125)	0.24 (0.628)	5.52 (0.001)	0 > 1 (= 2 = 3)	4.91 (0.031)	10.7 (0.002)	0.01 (0.945)
	Adolescent (14)	9.29 (7.71)	7.79 (5.95)	7.79 (7.29)	8.14 (6.90)							
Ineffectiveness	Adult (47)	6.47 (4.84)	4.53 (4.94)	3.00 (3.47)	4.19 (5.03)	0.21 (0.886)	0.08 (0.784)	7.51 (<0.001)	0 > 1 (= 2 = 3)	8.95 (0.004)	13.4 (0.001)	0.11 (0.740)
	Adolescent (14)	6.79 (6.38)	4.86 (7.17)	3.94 (5.28)	4.00 (6.08)							
Perfectionism	Adult (47)	6.74 (3.54)	5.74 (3.91)	4.89 (3.38)	5.43 (4.03)	1.02 (0.316)	0.03 (0.864)	2.36 (0.130)	-	-	-	-
	Adolescent (14)	6.00 (3.55)	5.07 (3.43)	5.57 (4.13)	5.50 (3.44)							
Interpersonal distrust	Adult (47)	5.36 (4.68)	3.91 (4.38)	2.77 (3.24)	3.55 (4.21)	0.13 (0.943)	0.06 (0.809)	11.9 (<0.001)	0 > 1, 2, 3 1 > 2	10.9 (0.002)	22.3 (<0.001)	0.55 (0.463)
	Adolescent (14)	5.89 (4.68)	4.21 (4.15)	3.07 (4.07)	3.50 (3.11)							
Interoceptive awareness	Adult (47)	9.55 (5.01)	4.79 (5.07)	3.64 (4.01)	3.91 (4.90)	0.58 (0.448)	0.01 (0.946)	19.7 (<0.001)	0 > 1 (= 2 = 3)	22.6 (<0.001)	27.6 (<0.001)	1.06 (0.308)
	Adolescent (14)	8.29 (6.44)	5.21 (6.39)	4.14 (5.78)	3.93 (3.34)							
Maturity fears	Adult (47)	4.64 (3.94)	3.85 (3.91)	2.56 (2.65)	3.06 (4.11)	2.26 (0.083)	4.35 (0.041)	9.16 (<0.001)	0 > 1, 2, 3 1 > 3, Adult < young	17.3 (<0.001)	5.97 (0.018)	0.27 (0.605)
	Adolescent (14)	7.93 (5.08)	5.43 (5.84)	5.64 (6.13)	3.86 (4.17)							
Ascetism	Adult (47)	5.70 (3.38)	3.70 (3.53)	3.43 (3.07)	3.45 (2.96)	0.63 (0.596)	0.06 (0.812)	18.7 (<0.001)	0 > 1 (= 2 = 3)	28.9 (<0.001)	24.7 (<0.001)	5.03 (0.029)
	Adolescent (14)	6.50 (4.59)	3.36 (3.48)	3.71 (3.79)	3.57 (3.98)							
Impulse regulation	Adult (47)	5.40 (4.28)	3.87 (4.38)	2.30 (3.02)	2.40 (3.88)	0.37 (0.775)	0.25 (0.618)	13.1 (<0.001)	0 > 1, 2, 3 1 > 2	16.1 (<0.001)	21.0 (<0.001)	0.90 (0.346)
	Adolescent (14)	5.21 (4.00)	3.00 (4.61)	1.36 (2.98)	2.50 (4.01)							
Social insecurity	Adult (47)	5.79 (3.62)	4.38 (3.58)	3.26 (2.76)	3.79 (3.46)	0.46 (0.503)	0.27 (0.607)	13.9 (<0.001)	0 > 1 (= 2 = 3)	12.4 (0.001)	32.1 (<0.001)	0.06 (0.816)
	Adolescent (14)	6.71 (4.07)	4.29 (4.34)	3.86 (4.28)	4.29 (3.85)							

**Table 4.** (continued)

ED1-2 subscales	Group (n)	Means (SD)				ANOVA: F (p value)			Polynomial trends (time): F (p value)*			
		T0 (baseline)	T1 (4 months)	T2 (7 months)	T3 (18 months)	Interaction	Group	Time	Contrasts (time) <sup>a</sup>	LT	QT	CT
Total score	Adult (47)	83.04 (34.04)	56.09 (37.71)	40.62 (27.50)	47.44 (36.06)	0.52 (0.673)	0.08 (0.773)	28.1 ( $<0.001$ )	0 > 1, 2, 3  1 > 2	36.6 ( $<0.001$ )	45.5 ( $<0.001$ )	0.15 (0.698)
	Adolescent (14)	82.19 (42.71)	55.50 (45.30)	49.53 (42.62)	50.93 (36.08)							

*LT* linear trend, *QT* quadratic trend, *CT* cubic trend  
<sup>a</sup>Multiple comparisons with Bonferroni's correction  
<sup>\*</sup>Metric for polynomial contrasts taking into account the different interval between phases (0, 4, 7, 18)

time that is convenient for them, and they don't need to attend a face-to-face session at a precise time. Possible shame and embarrassment felt in a face-to-face therapy are reduced by distant e-mail conversation and patients may be more open to discuss delicate and personal issues and feelings. Writing a text (in an e-mail) involves reflection of thoughts, emotions and behaviour.

One important task of the therapists' e-mail was to convey to the patient that there is somebody who is interested in their progress with the self-help programme and motivate the patient when necessary. A previous study by Sanchez-Ortiz [20, 21] has shown that content analyses of therapists' and patients' e-mails have revealed that therapists' e-mails include three different thematic topics: (1) Cognitive behavioural comments, (2) Supportive comments and (3) Technical or study related contents. The supportive comments were the most frequent. For the patients, the e-mail support was essential for their motivation to continue with the programme, complete the modules and fulfil the exercises. It has been speculated that these supportive interchanges may enable to establish a therapeutic alliance between the therapist and the patient.

Summarising, we can conclude that Internet and e-mail assisted guided self-help is equally effective for adolescents as it is for adults. Self-help formats with e-mail guidance can be recommended as a first step in the treatment of BN in order to avoid a chronic course of the disease. It can be sufficient and lead to an abstinence of symptoms, and improvement of eating disorder associated cognitions, or it can serve as a first step to continue with formal psychotherapy.

Although research regarding effective treatments for adolescents is still in its infancy, it has been suggested that for adolescents with BN, CBT-based treatments and FBT seem to be the most successful [22]. It has been also suggested that the fit of therapist and patient is at least as important as the theoretical therapeutic background even more for adolescents. Moreover, parental involvement appears to be important for therapeutic outcome, especially for this age group. It has been recommended that parents should be provided with informational sessions even if family-based treatment is not employed. In our Internet-based treatment, family members have not been addressed but future online treatment might include modules for parents.

### Limitations and future studies

This article is based on further analyses of a RCT with its main results published elsewhere [15]. Patients were recruited from different sources, and do not represent a clinical sample. However, more than 65% have experienced previous formal psychotherapeutic or in-patient treatments and showed a long eating disorder history (mean duration of 8 years) and severe eating disorder symptomatology. Nevertheless, it is a group of self-selected patients who might be highly motivated for

self-help programmes. We were not only interested in post-treatment results but also in long-term follow-up evaluations. Despite our efforts to interview all patients who initially started treatment, we lost contact with 39.8% of the patients and do not have information on their outcome. We might speculate that those who could not be reached for follow-up evaluation may still suffer from an ED and therefore refused to participate.

Further analyses not only need to focus on predictors for good outcome, but also treatment attrition in order to find out for which patients these Internet-based treatments are especially helpful and those who tend to drop-out. Predictors should not only include psychiatric co-morbidity, eating disorder specific variables, but also personality factors and motivation. Based on these results, future studies should evaluate different treatment methods for different types of patients.

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#### Conflict of interest

There is no conflict of interest.

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